PATENT CLAIMS

1. A method for designing a component for an industrial plant, in particular a thick-walled component for a power plant, by means of an iteration comprising the steps of

   a) computing a plurality of process variables by means of a process simulator,

   b) modelling growth of at least one hypothetical crack in the component, based on a structure of the component and the process variables,

   c) computing a life expectancy for the component by determining a time required for a dimension of the hypothetical crack to exceed a given critical limit,

   d) modifying the structure of the component,

   e) repeating steps b) through d) until the time required for the crack dimension to exceed the given critical limit fulfils a pre-determined requirement,

   characterized in that

   - a time dependent load-profile and
   - a dynamic process simulator capable of modelling transient process behaviour is used to compute the process variables.

2. The method as claimed in claim 1, characterized in that

   - the process variables are re-computed by means of the process simulator each time the structure has been modified.

3. The method as claimed in one of the previous claims, characterized in that
   - stress exerted onto the component is computed from some or all of the process variables and
   - is used as a driving force in modelling the growth of the at least one hypothetical crack.

4. The method as claimed in one of the previous claims, characterized in that
   - growth with time of a length a of the at least one hypothetical crack is modelled as creep crack growth according to $\frac{da}{dt} = \gamma (C_t)^m$, where C_t a is crack tip parameter that depends on the component geometry and a stress exerted on the component, γ a material creep constant, and m a component specific constant.

5. The method as claimed in one of the previous claims, characterized in that
   - growth per cycle of a length a of the at least one hypothetical crack is modelled as fatigue crack growth model according to $\frac{da}{dN} = \frac{C\left(\max(\Delta K - K_{th}, 0\right)^{n fatigue}}{\frac{K_{crit}}{K_{max}} - 1}$, where ΔK is an amplitude of a stress cycle, N the number of cycles and the remaining variables are component specific constants.

6. The method as claimed in one of the previous claims, characterized in that
   - the load profile contains at least one start-up or at least one shut-down of the power plant or .

7. The method as claimed in one of the previous claims, characterized in that
   - the load profile contains a plurality of load changes.

8. The method as claimed in one of the previous claims, characterized in that
   - the structure of the component is modified by modifying its material constitution or by modifying weld materials comprised by the structure.

9. The method as claimed in one of the previous claims, characterized in that
   - the computation of the plurality of transient process variables by means of the process simulator comprises a computation of tube temperatures and stress.

10. A computer program product comprising a computer readable medium, having thereon: computer program code means that, when loaded onto a computer, make said computer execute the method according to one of the claims 1 through 8.